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10/589,589	08/16/2006	Toshihide Sekido	HIP-06-1238	2699

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EXAMINER	
DYE, ROBERT C	
ART UNIT	PAPER NUMBER
1791	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

pto.phil@dlapiper.com

Office Action Summary	Application No.	Applicant(s)	
	10/589,589	SEKIDO ET AL.	
	Examiner	Art Unit	
	ROBERT DYE	1791	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 December 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,5,7-10,13-23,50,54,56-59 and 62-69* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1, 5, 7-10, 13-23, 50, 54, 56-59, 62-69* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *16 August 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This is a Non-Final Office Action in response to Applicant's Request for Continued Examination, dated 12/18/2009. Claims 1, 5, 7-10, 13-23, 50, 54, 56-59, 62-69 are pending.

Claim Objections

2. Claim 59 is objected to because of the following informalities:

3. In line 9 of Claim 59, the apparatus claim recites "and thereafter injecting said resin to complete molding", thus reciting a method step (verb agreement is inconsistent).

4. Appropriate correction is required.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. Claims 1, 5, 7- 9, 13, 16, 17-19 50, 54, 56- 58 62, 65 and 66-69 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sekido et al. (JP 2003-025347 of record, with English machine translation) in view of Advani (USP 7,517,481) and Loving (USP 6,203,749).

8. Regarding claims 1 and 50, Sekido et al. (hereinafter Sekido) discloses a RTM molding method and apparatus comprising a mold cavity defined by an upper and lower mold wherein a reinforcing fiber substrate is disposed. Sekido discloses the method involves disposing the fiber substrate within the mold, closing the mold (thus mold is clamped), applying a vacuum to the cavity, and then injecting resin into the cavity (paragraphs [0012-0015], Fig. 3). Sekido does not teach a method or apparatus wherein an intermediate member having grooves for resin paths formed on its surface and through holes communicating with said grooves extending to the fiber substrate is employed.

9. In the same field of endeavor of resin transfer molding, Advani discloses that it is often desirable in RTM molding to deliver resin to multiple locations of the mold cavity with specific timing, which can often require multiple gates and vents for flow control purposes (col 1, lines 19-30, col 4, lines 51-58). Advani teaches a mold apparatus wherein an intermediate member (120) is disposed on the surface of one of the molding dies and said intermediate member comprises grooves which extend across the surface and connected to through holes so as to deliver resin to multiple portions of the mold cavity (see Fig. 2-3; col 2, lines 20-39). It would have been obvious to a person having

ordinary skill in the art at the time of the invention to use a intermediate member as taught by Advani in the method and apparatus of Sekido for the purpose of providing a mold system which is capable of delivering resin at multiple locations in the mold cavity while avoiding material waste and excessive process time (col 1, lines 32-35).

10. Regarding the injection of resin "from a plurality of positions via said intermediate member almost simultaneously", the apparatus is capable of performing said feature. Additionally, it would be expected that the flow channels in the plate would fill up relatively quickly and thus begin entering the mold cavity from a plurality of positions within a short time interval due to the flow resistance through said grooves being lower than through a fiber reinforced substrate. Thus, such could be considered to be “almost simultaneous”.

11. Regarding the use of a groove for discharging resin, Sekido discloses mold system wherein an outlet is provided for discharging resin and gas. Sekido does not teach a groove which extends substantially over the entire circumference of said reinforcing fiber substrate. In the same field of endeavor of resin transfer molding, Loving teaches that in order to have the vacuum spread evenly throughout the interior of the mold, a vacuum perimeter is provided along the perimeter of the mold top so that the vacuum draws evenly throughout the entire mold (col 5, lines 1-5). This perimeter is illustrated as a groove formed in the molding die's surface (Fig. 1 or 9). Loving further states that the vacuum tube and perimeter can be located on the mold bottom as opposed to the mold top (col 7, lines 52-56, Fig. 9). It would have been obvious to a person having ordinary skill in the art at the time of the invention to dispose a groove

around the perimeter of the mold as taught by Loving in the method and apparatus of Sekido and Advani for the purpose of ensuring that the vacuum draws evenly throughout the entire mold.

12. Regarding claims 5 and 54, Loving states that it would be obvious to locate the perimeter groove at the top, bottom or middle of the mold (col 7, lines 52-56). Additionally, Advani discloses that the intermediate member can comprise venting channels as well (col 3, lines 1-5).

13. Regarding claims 7 and 56, Advani does not disclose what material the intermediate member is made of. However, metal is a well known material for constructing mold platens (Sekido discloses the metal upper and lower molds, [0019]). It would have obvious to a person having ordinary skill in the art at the time the invention was made to construct the intermediate member from metal since is have been held to be within the ordinary skill of worker in the art to selected a known material on the basis of its suitability for the intended use. One would have been motivated to use metal for the purpose of constructing the mold from a material with high strength and durability. Sinclair and Carroll Co. v. Interchemical Corp., 325 US 327, 65 USPQ 297.

14. Regarding claims 8, 9, 57, and 58, the combination of Sekido, Advani and Loving do not expressly teach nipping and sealing the resin and vacuum members between the intermediate and opposing die. However, as illustrated by Advani, the resin and vacuum line connections are located at the edge of the plate wherein said plate is then sandwiched between an upper and lower mold platen (see Fig. 1 and Fig. 2A). In order

to connect resin and vacuum tubes to such an arrangement, it would have been obvious to a person having ordinary skill in the art at the time of the invention to nip the line connections between the die (at the parting line) and seal the resin and vacuum lines such that resin and pressure leaks could be prevented.

15. Regarding claims 13 and 62, Sekido discloses laminating reinforcing material onto a substrate ([0012]).

16. Regarding claims 16 and 65, wherein gas and excessive resin are discharged intermittently, such would be intrinsic to the mold of Sekido (combined). As resin infiltrates the preform and gas and excess resin are removed from the cavity, gas bubbles will inherently be released along with excess resin via the outlet. It would be expected that bubbles mixed with resin would be released during the resin infiltration step and thus result in intermittent release of gas and resin.

17. Regarding claims 17 and 66, wherein the flow rate of resin flowing into the mold is controlled by the pressure differential between the injection pressure of the resin and the pressure within the mold; such would be inherent to any resin transfer process. The flow of resin from one cavity (injection port) to a second cavity (mold) would inherently depend on a pressure drop driving the fluid flow. There would inherently be no net resin flow if the pressures are equal (Pm=Pi) and there would be positive flow if the injection pressure is higher than the mold pressure (Pi>Pm).

18. Regarding claims 18, 67 and 69, Sekido discloses valves 10 and 14 for controlling the inflow and discharge of resin from the mold (see Fig. 3)—thus controlling port diameters.

19. Regarding claims 19 and 68, the combination does not teach that the timing is stored in memory and that the process is automated. However, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to automate valve opening and closing, since it have been held that broadly providing a mechanical or automatic means to replace a manual activity which accomplishes the same result involves only routine skill in the art. One would have been motivated to automate the valve control of the resin flow rate in order to increase consistency in the filling process and reduce error in the control system. Regarding the timing of the adjustment being stored in memory, such would intrinsically be required for a control system to automatically function.

20. Claim 14, 15, 63, and 64 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sekido et al. (JP 2003-025347 of record, with English machine translation) in view of Advani (USP 7,517,481), and Loving (USP 6,203,749) as applied to claim 1 above, and further in view of Waldrop, III et al. (PGPub 2002/0022422).

21. Regarding claims 14 and 63, as discussed above for claims 8 and 57, it would have been obvious to a person having ordinary skill in the art to locate the resin and discharge tubes at the parting line between molding die (such is required for the tubes to connect with the intermediate member of Advani and appears to be illustrated in Fig. 3 of Sekido). The combination does not expressly teach sealing the portions between tube and die with an elastic material. In the same field of endeavor of resin transfer molding, Waldrop, III et al. (hereinafter Waldrop) disclose a resin transfer device

wherein Waldrop teaches that a simplified plumbing system to supply resin and vacuum reduces vacuum leaks and a preferable approach for porting is to deliver resin to the preform with tubes that pass through rubber seals which seal the vacuum pressure within the mold (paragraph 120). Thus, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to use rubber seals in conjunction with resin delivery tubes as taught by Waldrop in the mold of Sekido (combined) for the purpose of preventing vacuum and resin leaks.

22. Regarding claims 15 and 64, the Sekido teaches an O-ring 17 for sealing the cavity at the parting surfaces ([0023] and Fig. 3). Regarding the O-ring being incorporated into the elastic material for the seal, Waldrop teaches that tubes are preferably passed through the rubber seals of the cavity; thus the tubes would preferably pass through the O-ring seal of Sekido.

23. Claims 20-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sekido et al. (JP 2003-025347 of record, with English machine translation) in view of Advani (USP 7,517,481) and Loving (USP 6,203,749) as applied to claim 1 above, and further in view of Freitas et al. (USP 5,921,754).

24. Regarding claims 20 and 21, Sekido (combined) does not teach the resin flow rate, the projected area and the pressurizing force. In the same field of endeavor of resin transfer molding of composite material, Freitas et al. (hereinafter Freitas) teaches a method for molding turbine rotors wherein resin is injected at 20ml/min-60ml/min and at a pressure of about 30psi (about 0.2MPa). Freitas does not provide the projected

area; however, a 20ml/min-60ml/min flow rate would correlate with a projected area range of 0.033m^2 to 1.2m^2 (for claim 20) or 0.01 to 0.6m (for claim 21 using 30psi). One would expect a conventional rotor blade to fall within those areas. It would have been obvious to use the mold conditions of Freitas in the method of Sekido (combined) for the purpose of molding a diverse set of articles objects such as those of similar in size and construction to the rotor blades of Freitas.

25. Further, it would have been obvious to one having ordinary skill in the art at the time the invention was made to conduct the molding method according to the claimed flow rate, projected area, and pressure, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. One would have been motivated to adjust the flow rate and pressure for the purposes of ensuring sufficient resin infusion in a timely manner while preventing damage to the preform. In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235.

26. Regarding claim 22, as stated above, Freitas teaches a pressure of 30psi which is about 0.2MPa.

27. Regarding claim 23, the method for molding the articles of Freitas uses a temperature of about 350F for 2hours to cure the articles. While this temperature and time are slightly higher than the claimed ranges, it is well known in the art to select an appropriate temperature and curing time based on the type of resin used as well as the dimensions of the article. It is well within the skill of a person having ordinary skill in the

art to select the claimed curing time and temperature based on the type of resin used and size of the article.

28. Claims 10 and 59 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sekido et al. (JP 2003-025347 of record, with English machine translation) in view of Loving (USP 6,203,749), Oki (JP 2001-062932, English abstract of record, and English machine translation), and Johnson (USP 4,132,755).

29. Regarding claims 10 and 59, Sekido et al. (hereinafter Sekido) discloses a RTM molding method and apparatus comprising a mold cavity defined by an upper and lower die wherein a reinforcing fiber substrate is disposed. Sekido discloses the method involves disposing the fiber substrate within the mold, closing the mold (thus mold is clamped), applying a vacuum to the cavity, and then injecting resin into the cavity (paragraphs [0012-0015], Fig. 3).

30. Regarding the use of a groove for discharging resin, Sekido discloses a mold system wherein an outlet is provided for discharging resin and gas. Sekido does not teach a groove which extends substantially over the entire circumference of said reinforcing fiber substrate. In the same field of endeavor of resin transfer molding, Loving teaches that in order to have the vacuum spread evenly throughout the interior of the mold, a vacuum perimeter is provided along the perimeter of the mold top so that the vacuum draws evenly throughout the entire mold (col 5, lines 1-5). This perimeter is illustrated as a groove formed in the molding die's surface (Fig. 1 or 9). Loving further states that the vacuum tube and perimeter can be located on the mold bottom as

opposed to the mold top (col 7, lines 52-56, Fig. 9). It would have been obvious to a person having ordinary skill in the art at the time of the invention to dispose a groove around the perimeter of the mold as taught by Loving in the method and apparatus of Sekido for the purpose of ensuring that the vacuum draws evenly throughout the entire mold.

31. Sekido does not teach a method or apparatus wherein a groove is formed in the mold block surface, in the same field of endeavor of resin transfer molding, Oki et al. (hereinafter Oki) discloses an RTM molding die wherein a groove 2 is disposed on the surface of said die to promote the distribution of resin during the impregnation step. Oki discloses this promotes the uniform distribution of resin within a short period of time (see English abstract of record). It would have been obvious to a person having ordinary skill in the art at the time of the invention to employ a grooved mold surface as taught by Oki in the method/apparatus of Sekido and Loving for the purpose of promoting the uniform distribution of resin and reducing molding time. In the English machine translation, Oki discloses that the grooves have a depth of 2mm ([0042]).

32. The combination of Sekido, Loving and Oki still does not disclose a perforated plate or resin film which is disposed between the mold surface and the reinforcing fiber substrate. In the same field of endeavor of resin transfer molding, Johnson teaches the use of a perforated sheet or film 4 which is usually made of plastic material which is placed on top of the reinforcement material 2 (col 4, lines 60-65). Johnson states that the resin is evenly distributed through the pinhole-like apertures of the sheet, thus allowing the resin to reach every corner of the laminate without flowing lengthwise

through the reinforcement (col 3, lines 38-63). Although Johnson employs a vacuum bag setup, the impermeable sheet 3 acts effectively as a molding surface. The disclosure of Sekido notes that a metal molding die (Fig. 3) or a vacuum sheet (Fig. 4) disposed on the surface of the reinforcement die can produce equivalent results. It would have been obvious to a person having ordinary skill in the art at the time of the invention to employ a perforated sheet as taught by Johnson in the method and apparatus of Sekido (combined) for the purpose of promoting the even distribution of resin across the surface of the fiber reinforced substrate.

33. Regarding the presence of a gap between the perforated member and die, considering the perforated sheet must be located adjacent the resin entry point to ensure that said resin is distributed across the surface and through its holes, it would have been obvious for a person having ordinary skill in the art at the time of the invention to locate the sheet adjacent the mold surface containing resin distribution grooves. Oki teaches that said grooves should have a depth of about 2mm ([0042]), thus a gap of 2mm would be present between the perforated sheet and the die.

34. Regarding the injection of resin "from a plurality of positions via said intermediate member almost simultaneously", it would be expected that the flow channels in the plate would fill up relatively quickly and thus begin entering the mold cavity from a plurality of positions within a short time interval due to the flow resistance through said grooves being lower than through a fiber reinforced substrate. Thus, such could be considered to be “almost simultaneous”.

Response to Arguments

35. Applicant's arguments with respect to claims 1, 5, 7-10, 13-23, 50, 54, 56-59, 62-69 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ROBERT DYE whose telephone number is (571)270-7059. The examiner can normally be reached on Monday to Friday 8:00AM to 5:00 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joseph S. Del Sole can be reached on (571)272-1130. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/RCD/

/Joseph S. Del Sole/
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